

What is claimed is:

1. A nano-calcium phosphates/collagen composite, comprising collagen molecules and nano-calcium phosphates, wherein said composite in microstructure level is agglomerated particles having a diameter of 5-50 microns, and in nanostructure level is of multiple laminar structure having periodic repeated units, each periodic repeated unit having a thickness of 10-15nm and consisting of a layer of nano-calcium phosphates and a layer of collagen.
2. The nano-calcium phosphates/collagen composite of claim 1, wherein the collagen is type I collagen.
3. The nano-calcium phosphates/collagen composite of claim 1, wherein the weight ratio of nano-calcium phosphates to collagen molecules is between 2.2 to 2.8.
4. A process for preparing the composite of claim 1, comprising the following steps:
 - (a) dissolving collagen gel in acetic acid, then adding aqueous solutions of sodium phosphate and $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$, wherein the weight ratio of Ca:P is between 1:1 to 1.67:1, and the amounts of collagen and minerals used are corresponding to those in the natural bone;
 - (b) adding in drops sodium hydroxide solution until the calcium phosphates start to co-precipitate with collagen;
 - (c) maintaining the solution of step (b) at neutral pH and incubating the solution at 30°C for 1~5 days; and
 - (d) harvesting the composite by centrifugation, freeze-drying and grinding into fine powder.
5. A porous bone substitute or tissue engineering scaffold, comprising a complex of the composite of claim 1 and poly(lactic acid) or poly(lactic acid-co-glycolic acid), wherein the weight ratio of said composite and poly(lactic acid) or poly(lactic acid-co-glycolic acid) is between 3:7 to 1:1, the porosity is over 70% and the pore size is 100-500 microns.
6. The scaffold of claim 5, further comprising noncollagenous bone matrix proteins, such as bone morphogenetic protein and bone growth factors as well as multiple glycoproteins that can promote cell attachment and spreading.
7. A process for preparing a porous bone substitute or tissue engineering scaffold,

comprising the following steps:

- (a) dissolving poly(lactic acid) or poly(lactic acid-co-glycolic acid) in dioxane to a final concentration of 2.5-15%(w/v), then stirring the solution gently for 4 to 6 hours;
 - 5 (b) adding the nano-calcium phosphates/collagen composite powder of claim 1 with the ratio of composite: poly(lactic acid) or poly(lactic acid-co-glycolic acid) being 3:7 to 1:1;
 - (c) ultrasonicated the solution of step (b), then pouring into a mould and freezing at a temperature between 0 to -20°C overnight; and
 - 10 (d) transferring the frozen molded scaffold into a freeze drying machine to remove dioxane crystals.
8. A porous bone substitute scaffold obtained by the process of claim 7.
9. Use of the scaffold of claims 5, 6 or 8 in treating bone defect and bone fracture.
10. Use of the scaffold of claims 5, 6 or 8 in culturing osteocyte.

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